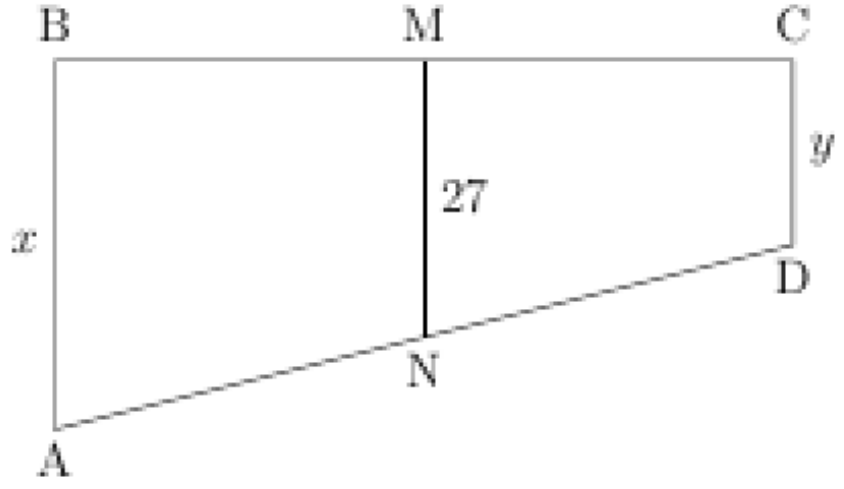
Topic: Midsegments of trapezoids

Question: Find the sum.

In the figure $ABCD$ is a trapezoid and M and N are midpoints of the legs. Calculate $x + y$.



Answer choices:

A 27

B 34

C 45

D 54

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Solution: D

You don't actually have to know the value of x or y to do this problem.

Because M and N are midpoints, $\overline{MN}$ is a midsegment.

$$27 = \frac{1}{2}(x + y)$$

$$54 = x + y$$

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Question: Find the length of the line segment.

In the coordinate plane a trapezoid $ABCD$ exists with vertices at $A = (0,8)$, $B = (12,8)$, $C = (9,1)$, and $D = (7,1)$. M and N are midpoints of the legs. What is the length of $\overline{MN}$?

Answer choices:

A 2

B 5

C 7

D 12

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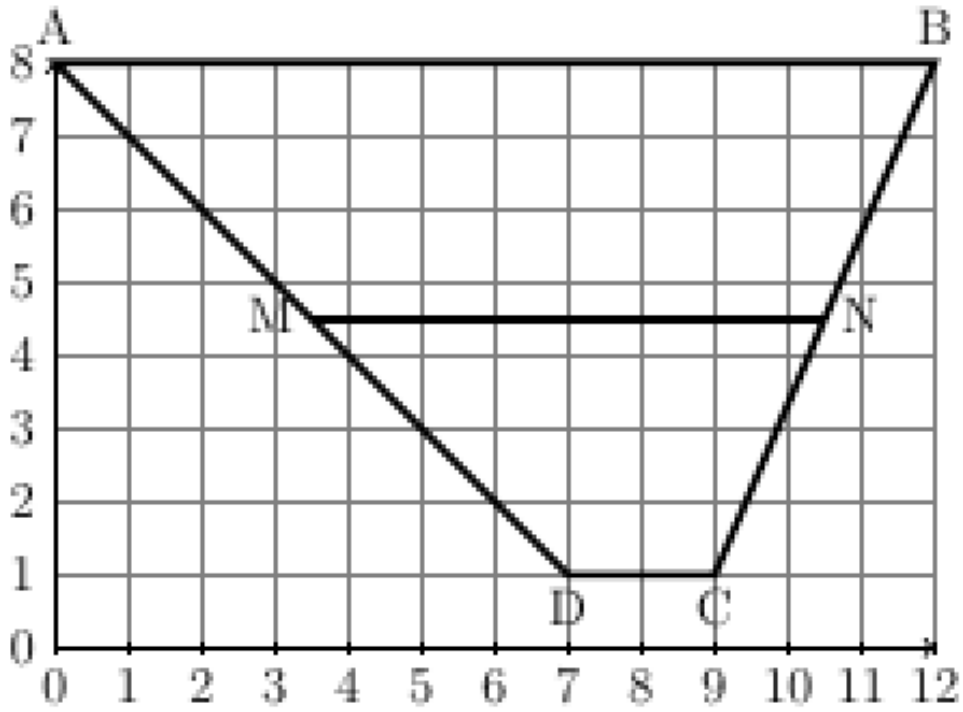
Solution: C

$\overline{AB}$ and $\overline{CD}$ are the bases and $\overline{MN}$ is a midsegment.



The coordinates tell us that $AB = 12$ and $CD = 2$. We can use those values to say that the length of MN is

$$MN = \frac{1}{2}(12 + 2)$$

$$MN = 7$$

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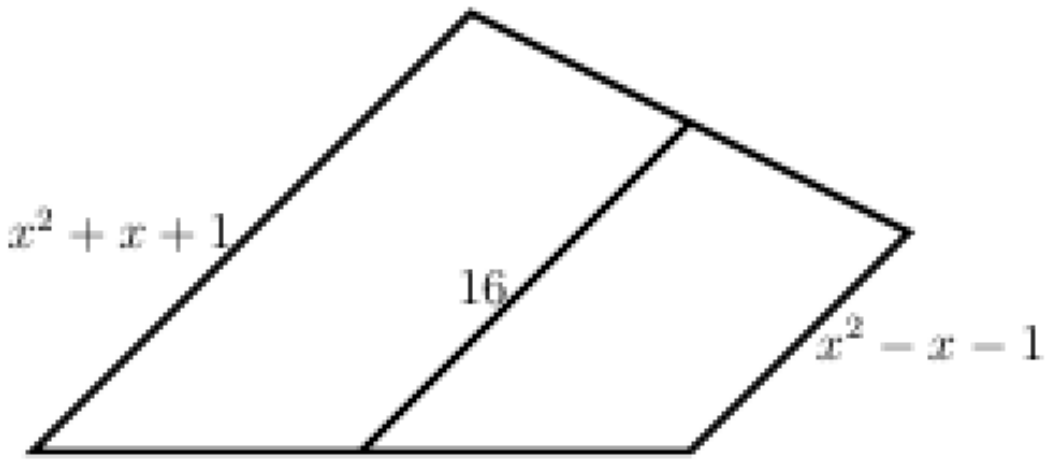
Topic: Midsegments of trapezoids

Question: Calculate the length of the shorter base.

In the trapezoid the length of the midsegment is 16, the longer base is $x^2 + x + 1$ and the shorter base is $x^2 - x - 1$.



Answer choices:

A 11

B 12

C 13

D 14

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Solution: A

The length of a midsegment is half the sum of the bases. Therefore,

$$16 = \frac{1}{2}\left[\left(x^2 + x + 1\right) + \left(x^2 - x - 1\right)\right]$$

$$16 = \frac{1}{2}\left(2x^2\right)$$

$$16 = x^2$$

$$\pm 4 = x$$

Use $x = -4$ to calculate the base lengths.

Long base = $(-4)^2 + (-4) + 1 = 13$

Short base = $(-4)^2 - (-4) - 1 = 19$

These results are contradictory, so rule out $x = -4$. That leaves only $x = 4$. So we get

Long base = $4^2 + 4 + 1 = 21$

Short base = $4^2 - 4 - 1 = 11$

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